They produce the sperm, but whose is it?: The 11 Biology of Spermatozoa Meeting September 5-9, 2011-Derbyshire UK

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Abstract: Sperm biology pervades numerous research areas from clinical research to evolutionary biology and animal conservation. Integrating these fields for a better understanding of each is one of the main goals of the Biology of Spermatozoa meeting, a conference held biennially outside of Sheffield in the United Kingdom. This September, at the 11th meeting, scientists from around the globe presented their ongoing research on numerous aspects of reproductive biology, from assisted reproduction in humans and animal conservation through stem cell research and proteomics to sophisticated evolutionary adaptations of ejaculates and female reproductive traits in order to bias paternity toward one or the other male in situations of female promiscuity. Throughout the conference, ethical controversies with reproductive applications (e.g., sperm banking) found their place just as much as novel clinical technologies (e.g., sperm quality assays) or major advances in understanding the mechanisms underlying fundamental processes of postcopulatory sexual selection (e.g., using transgenic animals that produce fluorescently labeled sperm). Across a wide range of different taxa, this meeting has presented a fascinating synthesis of current research and emerging directions in the study of sperm biology.

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They produce the sperm, but whose is it?

The 11th Biology of Spermatozoa Meeting September 5–9, 2011—Derbyshire UK

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Key words: Biology of Spermatozoa Meeting, reproductive biology, assisted reproductive techniques, evolutionary biology, postcopulatory sexual selection, sperm-female interactions

Sperm biology pervades numerous research areas from clinical research to evolutionary biology and animal conservation. Integrating these fields for a better understanding of each is one of the main goals of the Biology of Spermatozoa meeting, a conference held biennially outside of Sheffield in the United Kingdom. This September, at the 11th meeting, scientists from around the globe presented their ongoing research on numerous aspects of reproductive biology, from assisted reproduction in humans and animal conservation through stem cell research and proteomics to sophisticated evolutionary adaptations of ejaculates and female reproductive traits in order to bias paternity toward one or the other male in situations of female promiscuity. Throughout the conference, ethical controversies with reproductive applications (e.g., sperm banking) found their place just as much as novel clinical technologies (e.g., sperm quality assays) or major advances in understanding the mechanisms underlying fundamental processes of postcopulatory sexual selection (e.g., using transgenic animals that produce fluorescently labeled sperm). Across a wide range of different taxa, this meeting has presented a fascinating synthesis of current research and emerging directions in the study of sperm biology.

A healthy man produces some 1,500 sperm in every second. Unfortunately, increasing numbers of men suffer health-related fertility loss or reduction, or are facing medical treatments that will jeopardize future sperm production or sperm quality, either temporarily or permanently. For such men, sperm banking and assisted conception may be the only option if they wish to sire a baby. Today's sophisticated procedures to preserve or restore male (and female) fertility sometimes appear routine and almost trivial, as does, at first glance, the question of who owns the sperm that a man is banking for his future. But this simple question runs into many extremely complex ethical and legal issues, and there is still no clear-cut definition of who owns a man's sperm once they are outside his body. With a brilliant and provoking plenary talk on the controversy of ownership and usage of banked sperm, Allan Pacey (University of Sheffield) opened the 11th Biology of Spermatozoa (BoS) meeting in early September this year.

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For the past 20 years, Tim Birkhead and Harry Moore from the University of Sheffield have been organizing the biennial BoS meeting in the beautiful Peak District outside of Sheffield, United Kingdom. Every other year, some 60 participants—undergraduates, graduates and senior/established scientists—from all over the world come to present ongoing research and exchange novel techniques and inspiring ideas across a wide spectrum of topics related to reproductive biology. Despite its name, the Biology of Spermatozoa meeting is by no means restricted to the study of sperm, but rather provides an excellent platform for interaction and establishing collaboration among scientists working across numerous fields of reproductive biology—from assisted reproduction in humans and animal conservation to evolutionary biology, stem cell research and proteomics. These BoS meetings engender integrative approaches to investigating sperm biology and provide a good 'barometer' of current research emphases and of new or emerging research directions. One such emerging direction over the last few BoS meetings has clearly been the growing emphasis on the female side of reproduction, particularly in the study of evolutionary adaptations to ejaculates and other male reproductive traits, which cannot be fully understood without considering female effects (with recognition of the female reproductive tract in internal fertilizers as the selective environment for sperm). And so, this year, several talks were dedicated to the interactions between sperm and female traits, showing coevolution of female reproductive tracts and complex sperm morphologies in diving beetles, how female hormones (mice) or ovarian fluid (fish) affect sperm behavior, or that, if given a choice between compatible and incompatible eggs, sea urchin sperm released into a tank predominantly swim toward the compatible eggs.

An exceptional and invaluable feature of BoS is that, in contrast to many large conferences that tend to cram in many talks in often multiple concurrent sessions, the goal of the organizers is to keep the meeting relatively small and provide ample time for discussion and interaction among participants. So, every plenary and regular talk, typically of outstanding quality, is followed by 15 min of discussion or comments. This combination

of stimulating talks and a generous amount of discussion time creates an extremely inspiring atmosphere at these meetings. Thanks to the engaged audience with different research backgrounds, BoS provides a valuable forum for resolving technical issues in someone's project and for generating new ideas, research directions, and collaborations. These discussions are particularly constructive for early career scientists.

As in previous years, the scientific program of the 11th BoS meeting was incredibly diverse and intriguing, but there were also some common themes. For example, in addition to Allan Pacey's plenary talk, assisted reproductive technologies and concomitant ethical controversies were also integral to two other plenary talks. Eduardo Roldan (Museo Nacional de Ciencias Naturales, Spain) gave an overview of the methodological approaches and achievements, but also the challenges associated with conserving a number of endangered mammalian species. He also addressed the issues of inbreeding among the few individuals of these species left in captivity and how assisted reproduction might solve some of the logistic challenges to overcoming these obstacles. Harry Moore (University of Sheffield), in contrast, presented the recent advances and breakthroughs, but also ethical challenges, in the generation of germ cells from stem cells in mice and humans, nicely illustrated by various examples from in vitro to xenografting techniques.

Another overarching theme (and consistently manifest at BoS meetings) was the role of postcopulatory sexual selection in driving rapid evolutionary diversification of sperm and other reproductive traits. In an impressive plenary talk on the enormous body of experimental work using the fruit fly *Drosophila melanogaster*, Andy Clark (Cornell University) demonstrated the stunning complexity of interactions between sperm and female reproductive traits, and how they determine fertilization success. Fruit flies as a model organism in the study of postcopulatory sexual selection have received a lot of attention ever since Scott Pitnick's lab (Syracuse University) started using transgenic flies that produce either green or red fluorescent sperm heads and allow us to get at the mechanisms underlying postcopulatory selection processes (i.e., by visualizing sperm within the female after mating it to two males of reciprocal sperm-tag color under particular experimental conditions). These flies formed the basis of a variety of talks and posters this year, including one discerning the mechanisms of sperm-female interaction underlying reproductive isolation between hybridizing sister taxa.

To round up the evolutionary perspective, this year's BoS featured a symposium providing a taxonomic overview of studies of mating systems and postcopulatory sexual selection, to which most of the third conference day was devoted. A series of fascinating talks synthesized recent advances in our understanding of postcopulatory sexual selection and pointed out emerging research directions, across different animal groups from invertebrates through fish and reptiles to birds and mammals, including humans. These presentations demonstrated the staggering diversity and sophistication of adaptations in reproductive traits and behavior that different species have evolved to maximize the success of males in their competition for fertilization against rival males and to augment female control over the outcome of this competition.

All in all, and despite getting soaked by the rain during this year's traditional hike in the Peak District, I enjoyed an excellent meeting and agree with Bob Montgomerie (Queen's University, Canada) who demonstrated at the end of his talk how BoS is a particularly successful meeting for establishing and expanding a network of colleagues and collaborators in the field of reproductive and evolutionary biology. And so it may not be surprising that many participants come back time and time again, such as Nina Wedell (University of Exeter) who has been to all eleven meetings.

With this, I would like to thank Tim and Harry for their superb job in organizing another fantastic BoS, all participants for their engagement and creating such a friendly and stimulating atmosphere and the Swiss National Science Foundation for supporting my participation.

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